

Response to EPA Questions Regarding the Technical Memorandum titled *Cap Thickness Field Verification Testing: Recommendation to Use AquaGate+PAC™ Thickness Criteria Rather than Criteria Based on % by Volume or Weight*

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As described in the Technical Memorandum (CH2M HILL December 3, 2013), the CPG determined that the most accurate method to determine the adequacy of AquaGate placement is to calculate the equivalent depth of AquaGate application in an area. This utilizes measured as opposed to estimated values, specifically data on the daily volume of AquaGate applied (each bag contains approximately 1 cubic meter) and data on how much active layer area was completed during each day. With this method, it has been determined that the minimum thickness of AquaGate (2.5 inches) as well as the minimum average thickness (3.0 inches) has been met in all areas downriver of the No Dredge Zone requiring the "Standard" cap.

On Thursday, December 5, 2013 Stephanie Vaughn, USEPA Region 2, provided the following questions regarding placement of AquaGate in the area south of the No Dredge Zone;

- *In Table 1 of the TM, CH2M Hill provided the daily usage rates for AquaGate and the daily coverage rates. Based on these daily rates, CH2M Hill calculated the thickness of the AquaGate placed. However, when comparing the daily AquaGate usage volumes in Table 1 to the daily AquaGate usage rates provided in the Daily Production Volumes Nov 125.xls Excel table received from Stan Kaczmarek on 11/26, we notice discrepancies between the excel table and the Cap Thickness QAQC TM, in term of the daily volumes of Aquagate usage. The excel table shows a lower volume of Aquagate placement on 11/13, 11/14, 11/15, 11/16 and 11/18. When the Aquagate volumes from the Excel table and the estimated areas of placement from the TM were used to calculate the Aquagate thickness, the minimum thickness requirements of 2.5 inches were met except for 11/13, which has only 2.44 inches on that day. Additionally, the daily thickness of AquaGate for the days reported is less than 3 inches in 5 out of the 9 days. And finally, the overall average thickness is only 2.86 inches, which is less than the minimum average requirement of 3 inches. Please determine which AquaGate daily usage is correct and explain the discrepancies.*
- *Please explain how the area estimated and AquaGate usage was determined when the area was started on one day and finished on the next day?*

In response to these questions, CH2M HILL offers the following answers along with further lines of evidence to demonstrate that the AquaGate placement in the area south of the No Dredge Zone meets the requirements of the Capping Specifications, and is considered complete. This area is now ready for the next step; placement of the active cap layer.

Response #1;

The initial table provided was based on an assumption that the AquaGate superbags held less volume than 1 cubic meter based on the fact that the bags are loaded at the manufacturer to ~2500 lbs each, and the manufacturer had indicated in earlier spec sheets that the density of the AquaGate product was 80 lbs/ft³. However, repeated testing by Great Lakes and subsequent confirmation by AquaBlok (the manufacturer of AquaGate) indicated that the product as shipped has an average density of 72 lbs/ft³. The number of bags placed each day is still the same as originally reported, but the earlier data was revised to reflect that each bag really does hold very close to 1 cubic meter (actually 0.98 cubic meters, or 1.28 cubic yards) based on the field measured density data. Therefore, the data as listed in the AquaGate Placement QA/QC Tech Memo reflects the correct volume for each bag, and therefore it provides the correct AquaGate density in the active layer.

2,500	lbs / bag
72	lbs /cubic ft
34.72	cubic ft / bag
1.28	cubic yds / bag
0.98	cubic meter / bag

Response #2;

The square foot coverage utilized each day in these calculations is based on the equivalent active layer finished each day (e.g. the square feet that would be covered by 3 lifts providing 10 inches, or 2 lifts providing greater than 6 inches in high subgrade cap areas).

Additional Lines of Evidence

As stated in the EPA-approved High Sub-grade Cap Design Technical Memorandum (CH2M HILL October 8, 2013)

A revised cap design was developed for placement in high subgrade areas where at least 1.75 feet of sediment cannot be excavated prior to placing the cap. It is assumed for purposes of this design that residual contaminated sediment would remain on top of the high sub-grade as mechanical dredging cannot fully remove all sediment on top of this hard material. The revised cap would be placed to isolate this residual contaminated sediment. The revised cap design consists of 6 inches of active material (i.e., the same AquaGate and sand mixture as the standard RM 10.9 cap design), geotextile, 6 inches of Type B (D50 = 2 inches) armor stone, and a thin layer of sand just covering the top of the armor stone. Based on results from the CapSim analysis, the revised cap cross-section is expected to be protective for those conditions in near shore areas (i.e., water depths less than 10 feet-deep) with a high sub-grade.

For the area south of the No Dredge Zone, this High Sub-Grade modified cap equates to approximately 6.2% of the total area. So utilizing the total area for the area south of the no dredge zone (95,886 square feet) and the portion that represents the modified cap for High Sub-Grade Areas (5,968 square feet), you can make the following calculations based on the total AquaGate utilized for this area (953 cubic yards)

- The total volume of AquaGate required (based on an average thickness of 3 inches) for the Standard Cap Areas downriver of the No Dredge Zone is **833 yd³**
- The total volume of AquaGate required (based on an average thickness of 1.8 inches) for the Sub-Grade Modified Cap Areas downriver of the No Dredge Zone is **133 yd³**

Therefore, the total volume of AquaGate required to be placed downriver of the No Dredge Zone was **866 yd³**. The total volume of AquaGate placed from November 13 to November 22 was **953 yd³** which exceeds the required volume to be placed by **87 yd³** (10% more AquaGate was utilized than required to meet the specification).